scores indicate greater disability). The current study used baseline surveys linked to provincial health administrative databases (physician services; inpatient hospitalizations; Emergency Department visits; and prescription drug use in 65+ years) in OA participants with diabetes at baseline, defined as meeting criteria for inclusion in the Ontario Diabetes Database (sensitivity 86%, specificity 97%) or self-report. Multivariable Cox regression was used to examine the contribution of baseline OA functional limitations on time to a composite serious diabetes-specific outcome (hypo- or hyperglycemia, soft tissue infection, amputation, initiation of dialysis, or retinopathy), controlling for confounders. In a sensitivity analysis, we further controlled for receipt of a prescription NSAID in the pre-baseline year in those eligible for drug benefits at baseline (aged 66+ years). Outcomes were defined using validated algorithms. Individuals were censored if they emigrated, died or at the end of available data (Feb 28, 2012).

Results: Of 2220 OA cohort participants, 440 met criteria for concomitant diabetes at baseline (20%; mean age 71 years, 67.5% female). Of these 440 individuals, 79% had hypertension, 53% pre-existing CVD, and 74% were overweight or obese. Mean scores for OA functional measures were: 45/100 WOMAC function; 1/3 HAQ grip; and 2/3 HAQ walking. 55.5% reported use of a walking aid and 45% reported trouble with their wrist/hand/fingers. Over a median follow-up of 6.1 years (IQR 2.2–13.4), 185 (42%) experienced our composite outcome (11 hyperglycemia, 56 hypoglycemia, 132 infections, 13 amputations, 6 initiated dialysis, 38 retinopathy). Controlling for age, sex, BMI, pre-existing CVD, and specialist visits in the pre-baseline year, walking disability at baseline was independently and significantly associated with an increased risk for a diabetes complication (adjusted HR per unit increase in HAQ walking score = 1.20, 95% CI 1.01–1.43, $p = 0.04$), but no effect was found for baseline grip strength ($p = 0.10$). In sensitivity analysis with further adjustment for receipt of an NSAID prescription in those eligible for drug benefits at baseline (77%), both HAQ walking and grip strength scores were significant independent predictors of risk for a diabetes complication (adjusted HR per unit increase in score 1.36, 95% CI 1.05–1.66, $p = 0.003$ and 1.26, 95% CI 1.05–1.50, $p = 0.01$, respectively).

Conclusion: Our results suggest that in people with both diabetes and OA, OA-related walking disability, and possibly grip strength, increase risk for serious diabetes complications. Possible explanations include the negative impact of painful OA on diabetes self-management. Given the growing numbers of adults with coexisting OA and diabetes, these findings underscore the need for improved detection and management of OA in the diabetes population.

672
RISK PREDICTION OF KNEE OSTEOARTHRITIS USING ARTIFICIAL NEURAL NETWORK

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Purpose: Knee osteoarthritis (OA) is the most common joint disease of adults worldwide. Since there has been no effective therapy, treatments of advanced radiographic knee OA are limited. Studies have shown that the early diagnosis and treatment of OA could help preventing aggravation of symptoms. Late diagnosis results in the socio-economic burden of illness associated with OA. Therefore, clinicians face a significant challenge of identifying patients who are at high risk of radiographic knee OA in a timely and appropriate way. This study aimed at the first development and validation of artificial neural network (ANN) model for radiographic knee OA risk prediction. Few reports have investigated the ability of ANN for knee OA risk prediction in a clinical manner. Logistic regression (LR), which is the gold standard method for analyzing binary medical data, is also used to compare its performance with that of ANN.

Methods: ANN, one of the widely used approaches in machine learning, is an area of artificial intelligence technology and a mathematical system which mimic biological neural networks. The networks can be trained to recognize underlying patterns of diseases. ANN has been successfully used in medical decision support system. The 5th Korea National Health and Nutrition Examination Surveys (KNHANES V-1) data were used to develop ANN and LR models for radiographic knee OA. A logistic regression analysis was used to determine predictors for the models. The dataset were separated randomly into two independent groups, training and internal validation groups. The training group, comprised of two thirds (1777 participants) of the entire dataset, was used to construct the ANN and LR models. The internal validation group, comprised of one third (888 participants) of the entire dataset, was used to assess the ability to predict radiographic knee OA. In the KNHANES V-1, bilateral antero-posterior, lateral, and weight-bearing antero-posterior plain radiographs of knees were taken. Radiographic changes relating to OA were assessed using the Kellgren/Lawrence (KL) grade. The radiographic images were graded by trained two radiologists with concordant grades accepted. We defined radiographic knee OA as having KL grade ≥ 2 in one or both knees. Area under the curve (AUC) of the receiver operating characteristic (ROC), accuracy, sensitivity, and specificity were calculated to compare the performance of the two prediction models.

Results: The ANN and LR were built using the independent predictors including sex, age, body mass index, educational status, hypertension, moderate physical activity, and knee pain. In the internal validation, ANN and LR predicted radiographic knee OA risk with AUC of 0.81 and 0.76, accuracy of 73.6% and 68.0%, sensitivity of 73.2% and 73.8%, and specificity of 73.9% and 65.1%, respectively. Figure 1 shows ROC curves of ANN and LR for radiographic knee OA in the internal validation group. ANN had significantly better AUC than LR.

Conclusions: To our knowledge, we were the first to develop an ANN model for radiographic knee OA risk prediction using large population-based data. The ANN model might be a cost-effective screening tool identifying patients with untreated knee OA. These patients can then be received further evaluation such as knee radiograph and physical examination. The selected predictors including sex, age, body mass index, educational status, hypertension, moderate physical activity, and knee pain can be self-assessed or easily identified by the public health center. Therefore, the ANN can be easily used and might contribute to the advancement of clinical decision tools. Further studies should be targeted at constructing an extended prediction model for progressive knee OA through the collection of prospective data.

673
ASSOCIATION OF LOW BIRTH WEIGHT AND PRETERM BIRTH WITH THE INCIDENCE OF KNEE AND HIP ARTHROPLASTY FOR OSTEOARTHRITIS

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Purpose: To examine whether low birth weight and preterm birth were associated with the incidence of knee and hip arthroplasty for osteoarthritis (OA).

Methods: 3,604 participants of the Australian Diabetes, Obesity and Lifestyle Study who reported their birth weight and history of preterm birth and were aged more than 40 years at the commencement of arthroplasty data collection. The incidence of knee and hip arthroplasty for OA from 2002 to 2011 was determined by linking the cohort records to the Australian Orthopaedic Association National Joint Replacement Registry. Cox proportional hazard regression models were used to estimate the hazard ratios (HR) and 95% confidence intervals (CI) for the incidence of knee or hip arthroplasty for OA associated with low birth weight and preterm birth. Each analysis was adjusted for age, sex, body mass index (BMI), and level of education, with additional adjustment for hypertension, diabetes, smoking status and physical activity.

Results: One hundred and sixteen participants underwent knee arthroplasty and 75 underwent hip arthroplasty for OA. Low birth weight (yes vs. no, HR 2.04, 95% CI 1.11–3.75, $p = 0.02$) and preterm birth (yes vs. no, HR 2.50, 95% CI 1.29–4.87, $p = 0.007$) were associated with increased incidence of hip arthroplasty independent of age, sex, BMI, education level, hypertension and diabetes, smoking and physical activity. No significant association was observed for knee arthroplasty.

Conclusions: Although the findings of this study will need to be confirmed in other studies, these data suggest that individuals born with low birth weight or preterm birth are at increased risk of hip arthroplasty for OA in adult life. Understanding the underlying mechanisms warrants further investigation. However identifying individuals born with low birth weight or preterm birth as an "at risk group" for hip OA and targeting them for close monitoring and early interventions may decrease the development of hip OA in later life.